FCC Workshop on E911 Phase II Location Accuracy

November 18, 2013

E911 Phase II Location Technologies for AT&T Mobility (AT&T)

- GSM Network
  - Primary – Uplink Time Difference of Arrival (UTDOA)
  - Fall-back – Cell ID + timing advance
- UMTS/HSPA Network
  - Primary – Handset based AGPS
  - Fall-back – Round Trip Timing (RTT)
- LTE Network (planned)
  - Primary – Handset based AGPS
  - Fall-back – Observed Time Difference of Arrival (OTDOA)
- When is fall-back technology used?
  - For UTDOA, when there is an insufficient number of location measurement units to generate a location estimate
  - For AGPS – when there is an insufficient number of satellites to generate a location estimate

Fall-back Technologies: RTT and CGI+TA

RTT says it is in this arc.

Sector B

Serving Cell Site

Sector A

Sector C
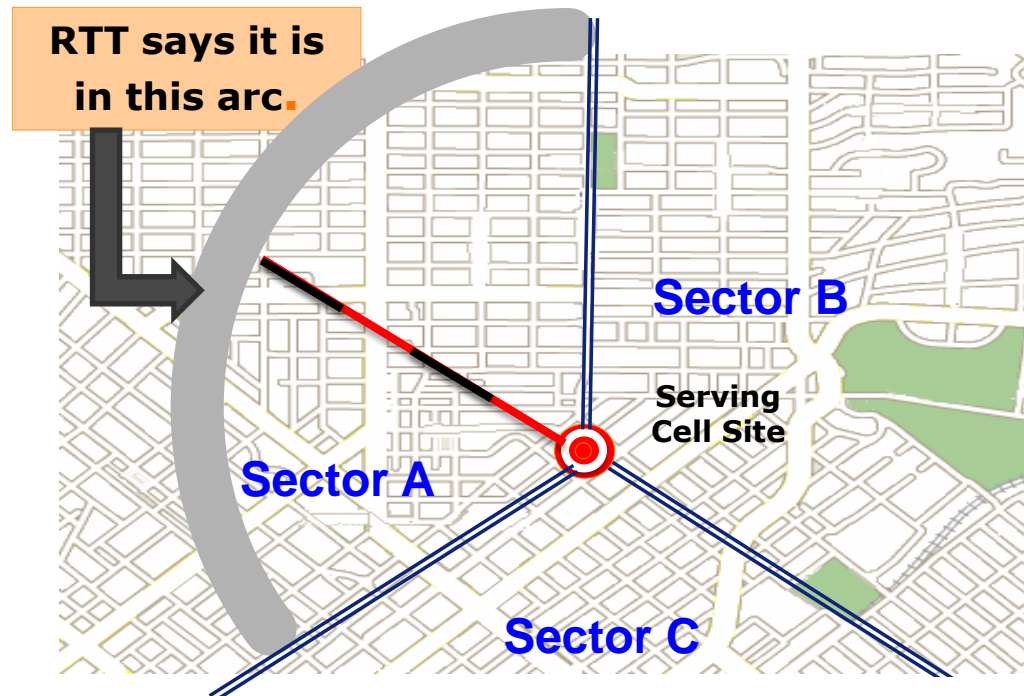
The mobility network transmits in radio frequency pulses. RTT counts the number of pulses between cell site and handset. Distance is roughly 50 meters times the number of pulses, or about 250 meters in this example.
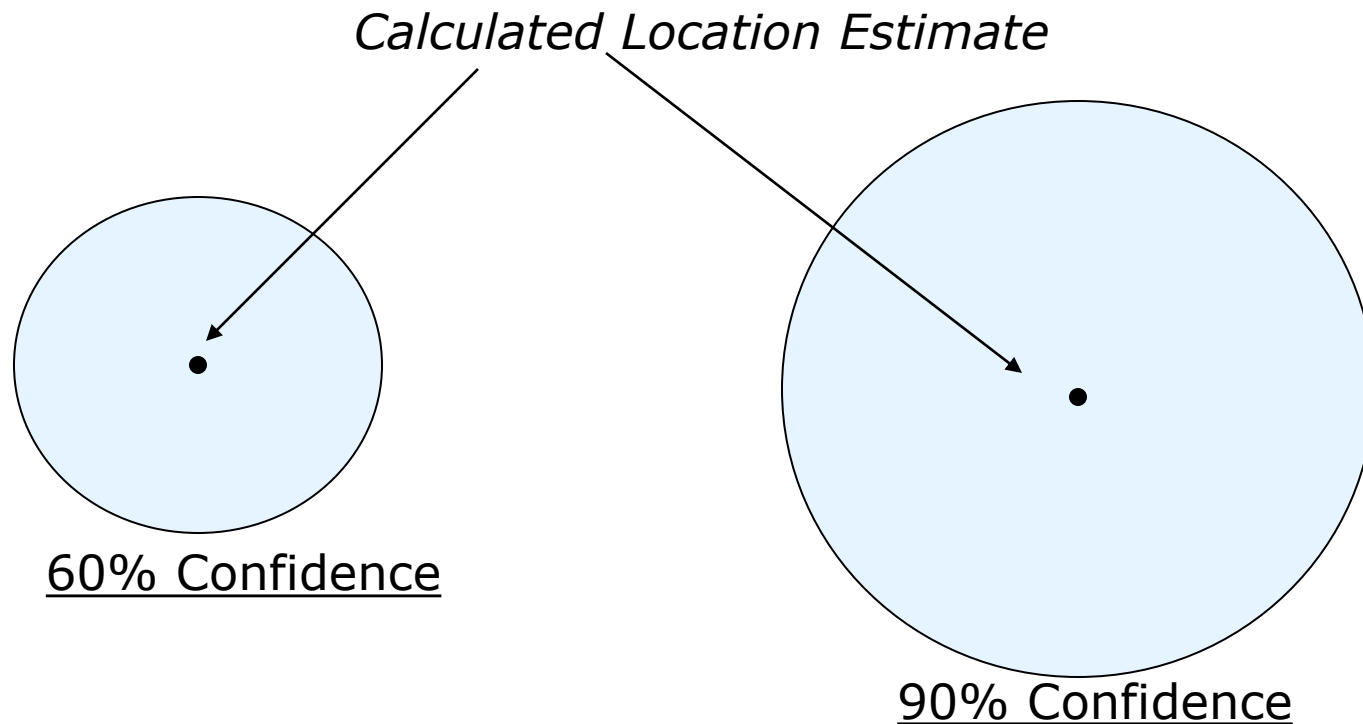
Confidence and Uncertainty

- What is Confidence and Uncertainty?

Confidence and Uncertainty

...reads as, "We are **C%** confident that the subscriber is within **U** meters of the estimated location."

Calculated Location Estimate

60% Confidence

90% Confidence

The size of the **Uncertainty** circle (or shape) varies based on the quality of the location estimate for an E911 call. The defacto standard **Confidence** level that AT&T reports is 90%. We state for each call that we are 90% confident the subscriber is within some distance of the location estimate we have returned.

Confidence and Uncertainty

- What are Confidence and Uncertainty?

- How are Confidence and Uncertainty calculated?
  - Algorithms for C&U are internal to location technology
  - Fix the Confidence level at 90%
  - Let the uncertainty vary based on the quality of location estimate
    - The number of satellites visible to the handset
    - The number of location measurement units that see a handset
    - The number of reflected signals that are seen
  - Both Confidence and Uncertainty are sent to the PSAP on a per call basis

Accuracy Testing

- AT&T performs accuracy drive tests per OET-71 and ESIF Recommendations

- Current testing methods are well-suited to outdoor compliance.
  - Check for contributions by each site or sector.
  - Produce accurate, easily understood statistical profiles by geographical unit – especially county.

- Current testing methods challenged by indoor requirements.
  - Drive testing reveals little about indoor performance.
  - Variation in physical structures challenges sampling methods for indoor testing.

- Future testing methods may move toward statistical process or quality control methods.
  - Determine initial quality with broad, initial testing.
  - Show continued compliance (no degredation) with smaller sample tests.

AGPS Success Rate in CA
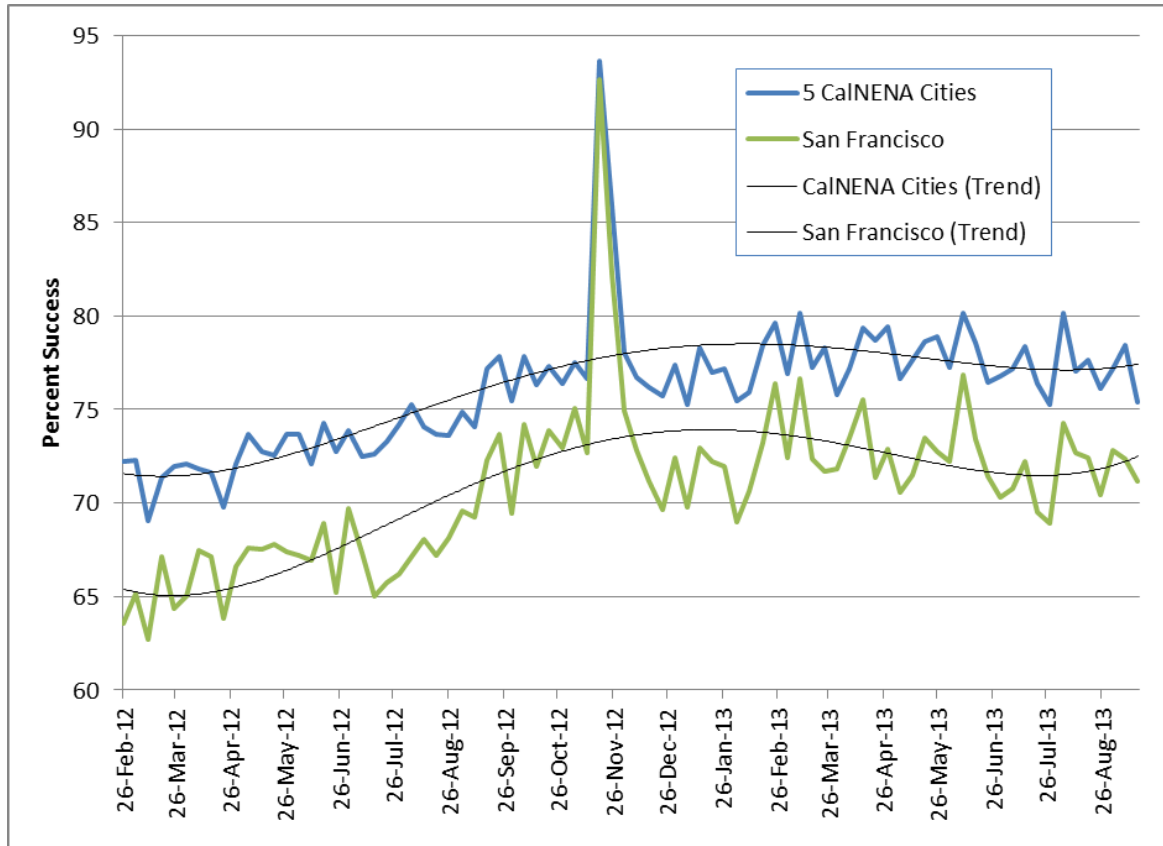
- 18 months prior to CalNENA Report

- Overall trend rising from 71% to 78%

- For calls lasting at least 30 seconds

Location Accuracy

- A trade-off exists between location accuracy and time (see CalNENA following slide)
  - More time produces better accuracy and vice versa
- Newer chips appear to be producing accurate locates faster while still meeting present standard
- Indoor location requirements may force carriers to allocate more time to meet new standard